

What is claimed is:

1. A method for providing service protection to service paths transporting client data packet streams received from a plurality of packet-based client interfaces over a TDM or WDM network, said service paths being assigned to said data packet streams on a per-client basis, said network comprising a plurality of nodes and, at each node thereof, a plurality of network interfaces for configuring data frames comprising client data packet streams for transport from and to said network, whereby each said client-based service path is defined by a selectable working path when said service protection has not been initiated for said service path, each said working path comprising a selectable bandwidth and at least one said network interface associated therewith, said method comprising:

- (a) designating selectable portions of said bandwidths of said working paths as unpreemptable and/or preemptable, whereby said preemptable portions of said working path bandwidths are made available for protection preemption by different working paths;
- (b) assigning a protection path to each said service path which is to be provided said service protection whereby each said protection path comprises a selectable bandwidth and at least one said network interface which is distinct from said network interface associated with said working path for said service path, whereby said protection path bandwidth comprises preemptable bandwidth portion(s) of working path(s) defining different service path(s) and/or unused network bandwidth;
- (c) in response to a protection switch request configured for initiating said service protection for a protection-designated service path, switching said protection-designated service path to define said protection-designated service path by said protection path assigned thereto, whereby said preemptable bandwidth portion(s) of said different service path(s) is(are)

preempted for use by said protection-designated service path and lost for use by said different client-based service path.

2. A method according to claim 1 whereby one or more unprotected service paths transport client data packet streams over said network and said working path bandwidth for each said unprotected service path is designated unpreemptable.

3. A method according to claim 1 whereby said protection path bandwidth consists of one or more said preemptable portions of said working path bandwidth(s) defining different said client-based service path(s).

4. A method according to claim 3 whereby said bandwidth of said protection path assigned to said service path is selected to be less than or equal to said working path for said service path.

5. A method according to claim 4 whereby said service paths are unidirectional.

6. A method according to claim 4 whereby said service paths are bidirectional and each said service path comprises receive and transmit nodes, each said node comprising one of said network interfaces, said switching being performed at each of said receive and transmit nodes of said service path.

7. A method according to claim 6 whereby said protection switch request is received by said receive node of said service path.

8. A method according to claim 7 whereby said bidirectional service path comprises asymmetric bandwidth, said bandwidth in one direction of said service path differing from said bandwidth in the opposite direction.

9. A method according to claim 8 whereby said network is a SONET network and each said bandwidth is comprised of a selectable number of STS-1s.

10. A method according to claim 9 comprising selecting said working path bandwidths on a dynamic basis in response to available network bandwidth to maximize use of said network bandwidth for said working paths.

11. A service path protection apparatus for providing service protection to selectable client-based service paths used for transporting client data packet streams over a TDM or WDM network, each said service path being defined by a working path under normal conditions and each said service path selected for protection being defined by a protection path when service protection has been initiated for said protected service path, each said working path being defined by a selectable bandwidth associated with a network interface, said apparatus comprising:

- (a) a bandwidth allocation controller configured for:
 - (i) designating selectable portion(s) of said bandwidth of a working path for said protected service path as unpreemptable and/or preemptable, said preemptable portion(s) of said working path bandwidth being available for protection preemption by a different working path; and,
 - (ii) assigning a protection path to each protected service path, each said protection path comprising a selectable bandwidth associated with a network interface which is distinct from said network interface associated with said working path for said protected service path, whereby said protection path bandwidth comprises preemptable bandwidth portion(s) of working path(s) for different service path(s) and/or unused network bandwidth; and,
- (b) a service path protection switch operable in response to a protection switch request and configured for switching said protected service path to define said protected service path by said protection path assigned thereto, said

preemptable bandwidth portion of said protection path being preempted for use by said protected service path and lost for use by said different service path.

12. The apparatus of claim 11 wherein said bandwidth allocation controller is configured for designating selectable bandwidth portion(s) of said working paths as protected or unprotected, wherein said unprotected bandwidth portion(s) is(are) designated unpreemptable.

13. An apparatus according to claim 12 wherein said protection path bandwidth consists of said preemptable portion(s) of said working path bandwidth(s) for different service path(s).

14. An apparatus according to claim 13 wherein said protection path bandwidth is selectable to be less than or equal to said working path for said service path.

15. An apparatus according to claim 14 wherein said service paths are unidirectional.

16. An apparatus according to claim 14 wherein said service paths are bidirectional, each said service path comprising one said protection apparatus at a receive node at one end of said service path and another said protection apparatus at a transmit node at the opposite end of said path, said service path protection switch being configured for communicating with said service path protection switch of said other apparatus to complete said switching.

17. An apparatus according to claim 16 whereby said bidirectional service paths comprise asymmetric bandwidth, said bandwidth in one direction of said service path differing from said bandwidth in the opposite direction.

18. An apparatus according to claim 17 wherein said network is a SONET network and each said bandwidth is comprised of a selectable number of STS-1s.

19. An apparatus according to claim 18 wherein said bandwidth allocation controller is configured for selecting said working path bandwidths on a dynamic basis in response to available network bandwidth at a given point in time, whereby use of said network bandwidth for said working paths is maximized.